Relative Intelligibility of Five Dialects of English

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In the production of the various linguistic Atlases of the English language, numerous word lists and phonetic descriptions have been made of the many regional and social dialects of English, with "dialect" being defined as special varieties of usage and/or pronunciations within the range of a given linguistic system. (Reed, 1967, p. 2) Thus, a language may be considered to be a collection of related dialects in a particular area, often encompassing a single nationality. Carroll Reed (1967, p. 2) has said, "Languages are not mutually intelligible; different dialects of the same language are ordinarily mutually intelligible (with some notable exceptions, such as certain dialects of Chinese)." The purpose of this study is to determine how intelligible certain dialects of English are to native speakers of one particular dialect.

In a study by L. S. Harms (1961), listeners of three status groups attempted to reconstruct spoken messages of speakers of the three statuses. Listeners achieved highest comprehension scores when speaker and listener status were the same. In the present study, this result has been modified to include unintelligibility of regional dialects. Five dialects of English were presented to listeners who were native speakers of one of the dialects. Highest intelligibility scores were expected when speaker and listener dialect coincided. Since no other data in relative intelligibility of the five dialects involved in the study are available, no prediction was made as to the most difficult dialect to understand.

Dialects for the study were chosen on the basis of their differences from the control dialect, which was that of Columbus, Ohio. At least two of the speakers chosen demonstrated idiolectal differences, but the speakers were selected because their speech patterns were very close to those of the dialects they represented, and quite different from those of the control dialect.

The dialects chosen for the study were: Columbus, Ohio, an example of General American speech; Long Island, New York, Jewish community; Portsmouth, Ohio, an example of what can be called Rural Southern Ohio speech, a mixture of General American and Southern speech; one variety of British stage speech; and Black American, (urban variety of this dialect, rather than what is known as Southern Negro speech). No attempt was made to investigate intelligibility of dialectal words and sentence patterns. The test which was used examined only word intelligibility, i.e. pronunciation differences.

Brief descriptions of the dialects follow. All are taken from C. M. Wise's Applied Phonetics (1958). Only the more prominent features are listed with particular attention to those characteristics

which are applicable to the listening test items.

General American Speech is characterized by the following pronunciations:

1. [ɔ] is the most common low back vowel except in words like water, sorrow, not and possible, where the vowel is [ɑ].

2. [æ] and [ɛ] are in free variation in words like care and dear.

3. Stressed long vowels diphthongise; for example, [eɪ] in ate and stay; [oʊ] in go, soul, and below. The diphthongs appear as pure vowels in weakly stressed syllables.

4. Central vowels are [ʌ], which is close to [ə] except in tenseness and duration, and [ɝ], as in bird, turn, and murmur.

5. All unstressed vowels reduce to [ə] or [ɨ] except [e] and [i] before another vowel. These two vowels reduce to [i]. [ə] before [l], [m], [r], and [n] reduces to syllabic [l̩], [m̩], [r̩], and [n̩].

6. [r] is always pronounced and never intrusive except sometimes in wash.

7. [l] is usually back except after high front vowels, and is often rounded after rounded vowels.

8. [t] is frequently lost when final.

The Southern-General American border region is characterized more by stress and intonation patterns than by specific phonetic qualities, but some characteristics are evident:

1. Retracted stress is common in words like cement and insurance.

2. Words are frequently run together and forms like you'ns, you'zl, and y'all are common for you (plural), you will and you all, respectively.

3. [ɛ] goes to [ɪ] always before nasals except in been and since, where the opposite happens.

4. [ɪ], [ɛ], and [æ] are raised before all front consonants.

Black Urban speech is characterized by voice quality as much as any other factor, but a few outstanding phonetic tendencies are indicated:

1. Word final stops are nearly always lost.

2. [θ] goes to [t] and [ð] to [d], particularly in pronouns and demonstratives.

3. Stressed vowels diphthongize, and the resulting diphthong sounds very like the first element.

4. Voiced consonants are often substituted for unvoiced ones; the reverse situation occurs equally often.

5. Consonant clusters are simplified usually by deletion of the stop in syllable final [sk], [sp], and [st] clusters.

The speech of New York City varies from borough to borough within the city. Some characteristics of the speaker from Long Island are listed here:

1. [ɔə] appears whenever a low back rounded vowel is followed by [r] as in horse.

2. Unrounded back vowels followed by [r] are lengthened as in New England speech, and the [r] is deleted.

3. [æ] is in free variation with [ɛə].

4. In nasalization, the nasal consonants are absorbed by the preceding vowels.

5. [ŋg] occasionally alternates with [ŋ] as in Long Island.

6. [l] is back and palatalized, often with no contact between tongue and alveolar ridge.

The variety of British speech used in the study has been somewhat Americanized, but still retains the "clipped" quality of British speech, and has a variety of low back vowels, most of which are not heard in General American speech.

1. Unstressed vowels reduce to [ɪ].

2. [æ] usually occurs in words like carry and parry; [ɛ] occurs in monosyllabics with [r].

3. [ɑ] is the so-called "broad a" in bath, half, aunt, etc.

4. [ɔ] is somewhat higher than American [ɔ], suggesting [o] when followed by [r], [l], and [w].

5. [ɜ] occurs in words like bird, turn and murmur; final [r] goes to [ə].

6. [ɾ] occurs intervocalically.

7. [l] is clear and frontal.

The selection of the testing procedure presented the greatest problem. A test was desired which perceived the different dialectal

intonations, yet tested the intelligibility of specific words. The large number of listeners necessitated a test which could be easily scored. Tests in which the listeners write down their answers, whether sentences, words, or nonsense syllables, involve a degree of phonetic sophistication and judgment on the part of both participant and scorer, particularly if the experimenter is interested in what errors occur.

Phonetically balanced word lists such as the Harvard PB Lists and various CVC word lists were unsuitable because intonation patterns are lost when the speaker pronounces one word at a time. Fairbanks' Rhyme Test and the Modified Rhyme Test, developed by House, et al., are multiple choice tests where the alternative responses differ from the pronounced word by one phoneme. These tests, while eliminating the need for judgment in scoring, still present the problem of single word utterances which are inadequate for testing dialect intelligibility. A problem also arises because listeners only have a choice between four or five expected responses.

The Cloye Procedure test used in Harms' study presents a form to the listener on which a short narrative, heard previously, is printed with blanks replacing certain words. The subject is instructed to fill in the blanks with the exact word used by the speaker. This kind of test has listener comprehension as its main parameter, rather than auditory intelligibility.

The test selected for the study was the Multiple Choice Intelligibility Test, developed by Haugen, Black, et al. (1963). These tests are constructed of twelve lists of twenty-four words each. There are four forms, A, B, C, and D, and four alternate response forms. A-1, B-1, C-1, and D-1. Words are separated into groups of three words with a carrier phrase, pronounced with no pause, as if it were an incomplete sentence. The carrier phrase is the number of the test item, with eight items per each of the twelve lists in one test. Thus, the first item would look like:

Number 1 crook fair amble

The answer sheet includes four possible responses for each of the three words and the listener is asked to consider each word and make the correct response.

The methodology of the test, i.e. the fact that each item of seven or eight syllables is read as a phrase, preserves the intonation and assimilation tendencies of each dialect, yet provides an exact measure of word intelligibility. Each word in a particular utterance is scored separately; analyses of variance have shown little or not difference among the three scores (Black, 1958). Because a multiple choice format specifies possible responses, the importance of linguistic sophistication among the listeners is reduced, and the study of confusion characteristics between the fixed population of words is made possible. The limitations which result from fixed responses are counterbalanced by the need for a test in which phonetic knowledge is not necessary.

The twelve lists of each test contain different words, but are equivalent in difficulty. Equivalent but unlike lists are necessary

to prevent a learning factor from affecting the reliability of the test as a measure of intelligibility. Forms A and B are somewhat less difficult in that they yield higher mean scores than Forms C and D. Form A was chosen for this study because of the naivety of high school age listeners which were employed.

Methodology

Six speakers recorded two lists of twenty-four words using an Ampex Model 350 tape recorder at 7 1/2 i.p.s. One list was taken from Form A of Black's Multiple Choice Intelligibility Tests; the second list was taken from the alternate response Form A-1. The lists of possible responses are identical for both forms; correct responses are different for each form. The lists were recorded in order that no speaker would read a list and its alternate (Speaker 6 was added after the recordings were finished, so that, in fact, he recorded two similar lists).

SPEAKER	DIALECT	LIST NO. A	LIST NO. A-1
1. C.B.	Columbus, Ohio	1	2
2. M.G.	New York-Jewish	2	3
3. B.N.	Rural Ohio	3	4
4. G.D.	British	4	5
5. J.H.	Columbus, Ohio	5	1
6. C.D.	Urban Black	6	6

The recordings were played on a Tandberg Model tape recorder to 65 senior high school students from four church groups located in the north side of Columbus, Ohio. The recordings were played in small meeting rooms with normal "classroom quite," with no noise in the signal. Listeners recorded their responses on standardized, printed answer sheets (Appendix 2), which had been duplicated by Multilith from the booklet "Multiple Choice Intelligibility Tests." Instructions for the listeners were adapted from the same booklet. The answer sheets were scored and checked by another scorer, and a frequency count of all litenener responses was done. Per cent counts were used to show how frequently each possible response was marked. Percentages were calculated by means of a simple Fortran program for an IBM 360 computer. The table was based on 63 as 100%, which was the number of usable listener responses for each list. Mean scores and standard deviation were calculated by computer.

Data analysis was performed on the basis of variance of mean intelligibility scores between dialects, using the Columbus speakers as controls, and assuming the mean scores of the control dialect to be 100% intelligible. Actual deviations from 100% intelligibility were assumed to be functions of the testing procedure.

Results

The results of the experiment are shown in Lists 1 through 6. The possible responses are shown on the left (N.A. indicates no answer was given). The numbers are the percentages of listeners who indicated

each response. Correct responses are underlined. Since answer sheets for both Forms A and A-1 are the same, two compilations are shwon on each list. The speaker who read each list is shown by initials at the top. A percentage conversion chart is shown in Appendix 1 indicating the percentage of 63 versus the number of listeners.

Mean scores for each dialect are shown below--the average number correct out of 48. Scores are shown in order of most intelligible to least intelligible to listeners from Columbus, Ohio.

Speaker J.H. - Columbus	- 45.24
Speaker C.B. - Columbus	- 43.72
Speaker G.D. - British	- 42.13
Speaker C.D. - Black	- 39.83
Speaker M.G. - New York	- 39.03
Speaker B.N. - Rural Ohio	- 35.86

Pages 1 and 2 of each listener's test form were separated for ease in scoring so mean scores and standard deviations were calculated for each speaker's lists separately. In the table below two scores are shown for each speaker; the upper score is from the list on Form A, the lower from Form B.

SPEAKER	LIST NUMBER	MEAN	S.D.
J.H.	5	21.79	2.06
	1	23.44	0.86
C.B.	1	20.78	3.40
	2	22.60	2.20
G.D.	4	25.65	3.24
	5	21.46	6.95
C.D.	6	20.38	1.93
	6	19.44	1.82
M.G.	2	19.05	2.10
	3	19.97	1.82
B.N.	3	15.24	3.49
	4	18.97	3.68

It was noted that scores for the alternate response form A-1 were slightly higher than those of form A. This was not predicted in the preparation of the test materials, and both forms were combined in the calculation of the overall mean scores.

Since no test of significance for percentages in groups of four could be located, any deviation over 15% (10 listeners of 63) will be considered in the analysis. Since some of the words on the test are easily confused in standard testing situations, some of these differences will not be explainable in terms of dialect differences, but rather as perceptual confusions inherent in the words and their alternate responses.

The first Columbus speaker, J.H., shows only a few instances where less than 85% of the listeners responded correctly. In all but three cases, the confusions are between stops, or between stops and ø, as between word, were; plot, clock, blot; kind, pine, time; quit, quick; world, whirl.

Trial was mistaken for trail 15.87% of the time. The only plausible explanation for confusion between [aɪ] and [eɪ] would be that the listeners were mistaken in orthography. The speaker pronounced trial very clearly and the experimenter can find no phonetic basis for the confusion.

Relieve was mistaken for relief 19.05% of the time. [v] and [f] in final position are commonly confused, and since relief is the final word of the utterance, the drop in volume would augment this tendency.

Legion was mistaken for legend by 22.22% of the listeners. In the test item, legend is followed by blunder, nearly obscuring the [d], if, indeed, it was pronounced at all. Legion-legend shows a tense-lax apposition which is confused in many Ohio pronunciations as in /mɛz / and /mež /.

The errors indicated for the other Columbus speaker, C.B., are somewhat more complicated. Court was mistaken for quart nearly half the time. C.B.'s [w] in quart was unvoiced, and nearly imperceptible. Instead of a clear [kw] cluster, she produced a slightly labialized [k^w], which was due to her own idiolect rather than any dialect characteristic. It is probable that [k^w] would be common in all dialects.

An interesting error was that concerning the ford flicker, which was heard by only 58.73% of the listeners. 15.87% heard liquor, easily explainable by the fact that flicker is preceded by group; [p] and [f] are quite similar and [f] might easily be mistaken for the aspiration of [p]. But 23.81% of the listeners heard quicker. Even if it is assumed that the [p] creates confusion in the following word, there is no basis for explaining the perception of [k^w] where [fl] was produced. In the alternate response form of this item, when the speaker pronounced quicker, 100.00% responded correctly. It can only be assumed that flicker is a word with high confusion tendencies, because of the low intensity of the [fl] cluster.

71.43% of the listeners heard rage correctly. The remaining listeners responded randomly among the other choices; four listeners did not respond at all.

Anger was mistaken for anchor 23.81% of the time; as in Speaker J.H.'s lists, voicing is confused, a function of the test words rather than dialect.

The last case of confusion in the utterances of the Columbus speakers is between confer and confirm. The word immediately following is verse; those listeners who heard confirm must have overcompensated for voicing, inserting a labial consonant between [r] and [v].

Other errors of these types occur in the responses to speakers of the other dialects. These kinds of errors will not be analyzed as they are functions of the test, and not induced by dialect. However, it should be noted that a greater number of test-induced errors occurred in the other four dialects than in the Columbus dialect, thus suggesting that overall intelligibility is affected by dialect, but not in predictable dialect errors.

One of the most outstanding features of the New York dialects is the distortion, or absence of [r] following a vowel. Many of the confusions shown in the lists of the New York speaker, M.G. (Lists 2 and 3), occurred in words containing [r].

Only 66.67% of the listeners responded correctly to horror. 3.17% heard father and borrow, respectively, and 26.98% heard power. The production of horror showed a short [ɔ] instead of [o] and the [ə] which nearly always replaces [r] sounded very like a [w]; the semi-vowel was made necessary for the transition to the next syllable, which was [ʌ]. In syllables ending with a vowel followed by a word or syllable beginning with a vowel, as horror is pronounced in New York, [r] is often intrusive. However, dissimilating influences prevent the introduction of [r] in this position.[1] [w] is quite a common replacement for [r] in child language; thus it is predictable that listeners who are unfamiliar with a New York [r] would hear [w].

Speaker M.G.'s [r]-sounds tend to resemble [w] in all positions. This peculiarity is not to be considered a functionally defective [r], since it is heard throughout this dialect area. It seems evident that the [r] distortion creates confusion with other liquids, such as [l] and [w], as occurred when the speaker pronounced grow. 7.94% heard glow, and 9.52% heard go with no liquid at all.

When drift was pronounced, only 12.70% of the listeners responded correctly. 49.21% heard drip, which can be explained in a manner similar to the arguments presented for Speakers C.B. and J.H., but 38.10% heard thrift. A [w]-like [r] would have a longer voicing feature than a clear [r] and a [d] with a weak onset might easily be mistaken for a [θ]. It is also common in this dialect for initial dental stops to be slightly affricated.

The responses generated bypproduction of gull are nearly random, but explainable by the New York substitution of [ɑ] for [ʌ] in stressed positions. Thus, 74.60% of the listeners heard the back vowel, responding with gall, gold, or goal.

Analysis of Speaker B.N.'s productions (Lists 3 and 4) were made difficult by the high percentage of listeners who did not indicate any responses.

In many cases nearly all listeners who responded did so correctly, but percentage scores in these cases are only between 60% and 80%; as a result, it is impossible to guess what the listeners thought they heard; they could not decide themselves. Therefore, only those items with a significant number of wrong answers indicated will be looked at.

Most of the errors in Speaker B.N.'s dialect are consonant confusions of manner; a few are errors in place of articulation. Speaker B.N. also exhibits diphthongization of vowels, common in the Southern speech area. This tendency has diffused throughout the Kentucky, West Virginia, and Southern Ohio area, creating what might be mistaken for a "Southern drawl." It is probable that this is the cause of amny of the no answer responses.

Two confusions are due to the backness of the [l], which occurs in both the Columbus and the Southern Ohio dialects. 28.57% of the listeners heard virtual when virtue was pronounced. In both dialects. the two words sound nearly alike; unstressed syllabic [l] often suggests [u] or [o], and the two words are easily confused. In the second case, 11.11% heard meadow when mettle was pronounced. Medial [d] and [t] are usually flapped, and the syllabic [l] immediately following the flap is articulated so far in the back of the mouth as to suggest [o].

Of the mistakes in manner of articulation, the most consistent is spear (34.92%) for sphere. Sphere is one of only a few English words with an [sr] cluster and would probably be confused in any dialect.

22.22% of the listeners mistook kernel for curdle, a nasal for its homorganic stop. 44.44% heard burst for birch; an [st] cluster for a prepalatal affricate, [tʃ]. The word immediately following is praise which could suggest a final stop rather than a fricative release.

When shave was pronounced, nearly 27% heard shade, a dissimilation from [f] in effect, the word following. Other confusions of this type occur as do mistakes in place of articulation; many more than occurred in the other tests. It is interesting that most of the listeners laughed when they heard the first few utterances of this speaker--perhaps an indication that they thought this dialect was very different from their own.

One example illustrates the similarity between the vowels [ɛ] and [ɪ] in the two Ohio dialects. When ten was pronounced (after chain), only 14.29% responded dorrectly. The remaining answers were nearly random between pen, pin , tent, and N.A. Here the stop confusion is not dialect related, but in the alternate response list, pronounced by Speaker M.G., nearly one-third of the listeners mistook pen for pin; since these two vowels merge in the Ohio dialects, the listeners would only differentiate them with careful listening, if at all.

Final [t] in a cluster is lost in Southern dialects. This is illustrated by this speaker where only 65.08% of the listerners heard plant.

The British dialect, spoken by Speaker G.D. (Lists 4 and 5), also shows a number of items with high percentages of N.A. responses, although this tendency was not consistent throughout the test. It was noticed that most listeners tended to have either a great deal of trouble, or little at all with this dialect. Relatively few scores are near the average, but at either end of the scale.

Intervocalic [r] is flapped in this dialect as are [t] and [d] in American dialects, so when storage was pronounced, it suggested a medial [t]; 17.46% of the listeners heard shortage.

The consonants of this speaker which involve oral pressure at some level seem to be characterized by their firmness, e.g. the onset is somewhat stronger than normal, thus some confusions in voicing result, as between folly and volley, smashing and matching. Other consonant confusions were mainly of manner (reverse for revert), but few of the errors show percentages over 15%. The items where the correct responses were marked less than 85% of the time were usually the items with high percentages of no answer. The extremely clipped quality of this dialect produces only a few test induced assimilation errors. Since most of the errors were not consistent, little else can be said about dialectal influences on the test responses.

Most of the errors indicated in Speaker C.D.'s Black dialect (List 6) are confusions of final consonants and clusters, although there are a few vowel-diphthong mistakes. In both lists for this speaker, prod and proud was confused, although proud was taken for prod more often than the reverse situation. The speaker diphthongizes all stressed vowels, and the resulting diphthong is typically similar

to the sound of its first element. Thus words like prod and proud are nearly undistinguishable in this dialect. The tendency is a residual quality of Southern Negro speech which is frequently heard even in the Northern urban areas of the country.

Some consonant confusions occur which are not dialect derived, mostly initial stop confusions and voiced stop-spirant confusions, but wherever the final consonant is the crucial element, mistakes occurred. Black speakers tend to drop or obscure final consonants in general, also a residue of Southern Negro speech; thus errors occurred for: new, noon, nude; law, log; term, turn; flat, flak; print, prince; wake, wait, wade; blast, black; jump, junk.

Tint and tense were confused, but besides the problem of final consonants, there is the merging of [ɪ] and [ɛ] which occurs also in the Ohio dialects.

In urban dialects in general, [θ] often goes to [t]. Indications of this occurred in the test when 20.63% of the listeners heard fateful when faithful was pronounced. Confusion also occurred between suit and shoot, but this is not believed to have been caused by the dialect of the speaker, but rather by his tendency to distort [s] to a slight degree.

Conclusion

The most intelligible speakers to listeners of the dialect of Columbus, Ohio, are speakers of the Columbus dialect. Relative intelligibility varies with dialect; dialects arranged in order of most to least intelligible are: Columbus, British, Black, New York, and Rural Ohio.

Unfortunately, only a few specific instances of dialect features are extractable from the mass of results for each list. Direct comparisons between lists are only possible for a list and its alternat response list. Some deviations occur in one list which do not occur in its alternate, suggesting differences between speaker-dialect intelligibility, but comparing successive lists is difficult because the test words are different.

A serious problem arose in evaluating the data--that of the test-induced assimilation errors. Although the number of these errors varies from dialect to dialect, they tend to obscure the general results. It is ironic that the reason for which the test was chosen, the phraselike structure of the test items, was the reason that the data were so difficult to interpret. Scoring the tests is quite simple, but the process of extracting frequencies of all responses is very time-consuming, since it must be done by hand.

Therefore, in the opinion of the experimenter, the usefulness of the test as a measure of dialect intelligibility is somewhat overshadowed by the assimilation errors caused by the testing procedure. Although the results did yield predicted variations, some amount of judgment was necessary to determine which errors were test-induced and irrelevant to the purpose of the study. However, it is believed that the multiple-choice format is the most desirable for studies of this kind. The great number of N.A. responses indicates that a greater

number of blank spaces would occur in a write-down test for naive listeners because they simply would not know what to write down.

Footnote

[1]Horror is seldom pronounced correctly by speakers of any dialect. What is usually heard is /hor·/.

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LIST #1

RESPONSE	C.B.	J.H.	RESPONSE	C.B.	J.H.
PORK	00.00	0.00	GROUP	98.41	0.00
WARM	0.00	100.00	TROOP	0.00	0.00
SWARM	100.00	0.00	COUPE	0.00	0.00
STORM	0.00	0.00	FRUIT	1.59	100.00
N.A.	0.00	0.00	N.A.	0.00	0.00
CORPUS	4.76	98.41	QUICKER	23.81	100.00
CANVAS	95.24	1.59	FLICKER	58.73	0.00
PAMPHLET	0.00	0.00	SLICKER	1.59	0.00
PANTHER	0.00	0.00	LIQUOR	15.87	0.00
N.A.	0.00	0.00	N.A.	0.00	0.00
COURT	42.86	4.76	BEEF	80.95	0.00
FORT	0.00	0.00	BEAST	4.76	0.00
PORT	7.94	95.24	BEAT	12.70	0.00
QUART	49.21	0.00	BEAM	0.00	100.00
N.A.	0.00	0.00	N.A.	1.59	0.00
AIRFORCE	1.59	0.00	REASON	1.59	0.00
AIRPORT	98.41	0.00	REGION	7.94	1.59
AIRCORPS	0.00	98.41	LEGION	84.13	22.22
AIRBORNE	0.00	1.59	LEGEND	4.76	76.19
N.A.	0.00	0.00	N.A.	1.59	0.00
SPARK	0.00	0.00	WONDER	87.30	0.00
PARK	3.17	0.00	BLUNDER	3.17	100.00
DARK	3.17	98.41	THUNDER	6.35	0.00
BARK	92.06	1.59	SPONSOR	0.00	0.00
N.A.	1.59	0.00	N.A.	3.17	0.00
TASSEL	98.41	1.59	CORN	1.59	0.00
TACKLE	1.59	0.00	TORN	0.00	100.00
CATTLE	0.00	0.00	HORN	96.83	0.00
PASTEL	0.00	98.41	BORN	0.00	0.00
N.A.	0.00	0.00	N.A.	1.59	0.00

RESPONSE	C.B.	J.H.	RESPONSE	C.B.	J.H.
STRETCH	1.59	0.00	RAID	6.35	93.65
THREAT	90.48	1.59	RATE	6.35	6.35
DREAD	3.17	98.41	RANGE	0.52	0.00
BREAD	0.00	0.00	RAGE	71.43	0.00
N.A.	4.76	0.00	N.A.	6.35	0.00
HEAR	0.00	0.00	FITTING	0.00	100.00
STEER	1.59	0.00	PRETTY	0.00	0.00
NEAR	0.00	100.00	CITY	96.83	0.00
DEER	98.41	0.00	SITTING	0.00	0.00
N.A.	0.00	0.00	N.A.	3.17	0.00
GUARD	1.59	0.00	OWL	1.59	0.00
HEARTEN	1.59	96.83	CALL	0.00	0.00
GARDEN	96.83	1.59	HALL	7.94	98.41
BARGAIN	0.00	0.00	ALL	85.71	1.59
N.A.	0.00	1.59	N.A.	4.76	0.00
CURTAIN	85.71	1.59	UNCLE	6.35	0.00
PERTAIN	0.00	0.00	BUCKLE	1.59	1.59
PERSON	1.59	0.00	KNUCKLE	90.48	98.41
CERTAIN	11.11	98.41	STUCCO	0.00	0.00
N.A.	1.59	0.00	N.A.	1.59	0.00
EXPORT	87.30	0.00	DREAD	0.00	0.00
EXTORT	0.00	98.41	DRESS	96.83	1.59
EXPERT	6.35	0.00	REST	3.17	98.41
ESCORT	1.59	0.00	RED	0.00	0.00
N.A.	4.76	1.59	N.A.	0.00	0.00
FILE	0.00	98.41	SCREECH	84.13	0.00
PANEL	0.00	0.00	PREACH	3.17	0.00
FUNNEL	1.59	0.00	REACH	3.17	0.00
FINAL	95.24	1.59	STREET	7.94	100.00
N.A.	3.17	0.00	N.A.	1.59	0.00

RESPONSE	M.G.	C.B.	RESPONSE	M.G.	C.B.
SKID	100.00	12.70	HEART	76.19	98.41
SKIN	0.00	0.00	BARGE	0.00	0.00
HID	0.00	85.71	LARD	0.00	0.00
HIT	0.00	1.59	HARD	25.40	1.59
N.A.	0.00	0.00	N.A.	1.59	0.00
MOVE	68.25	3.17	FASTEN	85.71	1.59
MOOD	33.33	1.59	PASSION	3.17	3.17
FOOD	0.00	92.06	FASHION	7.94	0.00
SMOOTH	0.00	0.00	PASSING	1.59	95.24
N.A.	0.00	3.17	N.A.	3.17	0.00
SWIM	0.00	1.59	ANGLE	1.59	0.00
TWIN	0.00	95.24	AMBER	1.59	0.00
SWIFT	0.00	0.00	ANGER	93.65	23.81
TWIST	100.00	1.59	ANCHOR	3.17	76.19
N.A.	0.00	1.59	N.A.	1.59	0.00
PROCLAIM	12.70	0.00	YOKE	1.59	96.83
DOMAIN	0.00	100.00	JOKE	98.41	3.17
COCAINE	0.00	0.00	CHOKE	1.59	0.00
PROFANE	88.89	0.00	DOPE	0.00	0.00
N.A.	0.00	0.00	N.A.	0.00	0.00
SPIN	7.94	0.00	CHAT	3.17	96.83
PIN	6.35	96.83	CHAP	6.35	1.59
THIN	69.84	1.59	SHACK	28.57	0.00
FIN	15.87	1.59	SHAFT	63.49	1.59
N.A.	1.59	0.00	N.A.	0.00	0.00
REPEAT	0.00	1.59	HEADING	0.00	0.00
RECEIVE	95.24	0.00	SITTING	0.00	96.83
RECEDE	6.35	0.00	KNITTING	100.00	1.59
REPRIEVE	0.00	96.83	FITTING	0.00	0.00
N.A.	0.00	1.59	N.A.	0.00	1.59

RESPONSE	M.G.	C.B.	RESPONSE	M.G.	C.B.
COURT	4.76	7.94	PIPE	74.60	3.17 6
CORD	0.00	92.06	PIKE	25.40	0.00
HORSE	0.00	0.00	TYPE	0.00	95.24
COURSE	95.24	0.00	TIGHT	0.00	1.59
N.A.	0.00	0.00	N.A.	0.00	0.00
BALANCE	92.06	1.59	BEAST	92.06	0.00
BALLOT	4.76	96.83	BEAT	3.17	98.41
GALLOWS	0.00	0.00	MEAT	0.00	1.59
VALID	4.76	0.00	LEAST	4.76	0.00
N.A.	0.00	1.59	N.A.	0.00	0.00
DRANK	11.11	1.59	DRAY	0.00	0.00
RANK	88.89	0.00	GREY	1.59	1.59
RANCH	0.00	0.00	SPRAY	96.83	0.00
DRAG	0.00	96.83	PRAY	1.59	98.41
N.A.	0.00	1.59	N.A.	0.00	0.00
BANKING	0.00	0.00	THRIFT	38.10	1.59
FLANKING	3.17	98.41	DRIP	49.21	0.00
LANKY	96.83	0.00	DRIFT	12.70	0.00
BLANKET	0.00	0.00	GRIP	0.00	98.41
N.A.	0.00	1.59	N.A.	0.00	0.00
BORROW	3.17	93.65	CONFIRM	19.05	19.05
HORROR	66.67	1.59	CONFER	1.59	80.95
FATHER	3.17	0.00	CONSERVE	20.63	0.00
POWER	26.98	3.17	CONCERN	57.14	0.00
N.A.	0.00	1.59	N.A.	1.59	0.00
UNFOLD	88.89	3.17	VERSE	7.94	92.06
UNTOLD	6.35	3.17 6	FIRST	87.30	4.76
CONTROLLED >	0.00	0.00	BURST	4.76	3.17
UPHOLD	4.76	92.06	HURT	0.00	0.00
N.A.	0.00	3.17	N.A.	0.00	0.00

RESPONSE	B.N.	M.G.	RESPONSE	B.N.	M.G.
DEED	0.00	1.59	DIMMER	6.35	0.00
WEED	3.17	0.00	DINNER	84.13	0.00
SEED	6.35	95.24	THINNER	1.59	98.41
FEED	69.84	0.00	TINNER	0.00	1.59
N.A.	20.63	3.17	N.A.	7.94	1.59
PROTRUDE	1.59	3.17	ENVY	52.38	0.00
CONCLUDE	73.02	3.17	EMPTY	1.59	0.00
CONSTRUED	1.59	92.06	ENTRY	20.63	100.00
INCLUDE	4.76	0.00	ENDING	0.00	0.00
N.A.	19.05	1.59	N.A.	23.81	0.00
TRAIN	68.25	1.59	RUMOR	69.84	12.70
CRANE	9.52	1.59	ROAMER	12.70	85.71
STRAIN	1.59	7.94	RUBBER	0.00	0.00
TERRAIN	3.17	87.30	ROVER	1.59	1.59
N.A.	17.46	1.59	N.A.	15.87	0.00
VIRTUAL	28.57	96.83	SPHERE	55.56	0.00
CURFEW	3.17	0.00	FEAR	3.17	1.59
VIRTUE	61.90	3.17	SPEAR	34.92	0.00
VIRGIN	0.00	0.00	BEER	0.00	96.83
N.A.	7.94	0.00	N.A.	6.35	1.59
HIDE	3.17	0.00	GULL	7.94	25.40
FIVE	0.00	0.00	GALL	6.35	12.70
HIRE	80.95	0.00	GOLD	63.49	39.68
FIRE	1.59	100.00	GOAL	15.87	30.16
N.A.	12.70	0.00	N.A.	6.35	0.00
PACK	3.17	0.00	PETAL	4.76	0.00
PATCH	85.71	0.00	METTLE	77.78	1.59
CATCH	4.76	3.17	MEADOW	11.11	0.00
CAT	0.00	96.83	SETTLE	0.00	98.41
N.A.	6.35	0.00	N.A.	6.35	0.00

RESPONSE	B.N.	M.G.	RESPONSE	B.N.	M.G.
FAULT	74.60	7.94	GLOW	6.35	7.94
VAULT	12.70	85.71	GO	90.48	9.52
DOG	0.00	0.00	GROW	0.00	82.54
FOG	0.00	1.59	GOAT	0.00	0.00
N.A.	12.70	4.76	N.A.	3.17	0.00
BURST	44.44	74.60	LATE	3.17	100.00
HURT	9.52	3.17	LADEN	1.59	0.00
FIRST	6.35	12.70	LAZY	0.00	0.00
BIRCH	23.81	4.76	LADY	92.06	0.00
N.A.	15.87	1.59	N.A.	3.17	0.00
TRADE	3.17	4.76	BREAK	80.95	66.67
TRACE	6.35	95.24	RAKE	7.94	14.29
PRAISE	71.43	0.00	GREAT	3.17	15.87
PRAY	4.76	0.00	GRAPE	3.17	3.17
N.A.	14.29	0.00	N.A	4.76	0.00
BLACK	3.17	1.59	CHANGE	34.92	9.52
TRACK	0.00	98.41	CHAIN	50.97	49.21
SLACK	90.48	0.00	STAIN	1.59	1.59
FLAK	1.59	0.00	SHAME	1.59	39.68
N.A.	4.76	0.00	N.A.	12.70	0.00
KERNEL	22.22	0.00	PEN	26.98	30.16
CURDLE	61.90	6.35	PIN	17.46	66.67
TURTLE	11.11	1.59	TENT	25.40	1.59
HURDLE	0.00	92.06	TEN	14.29	1.59
N.A.	4.76	0.00	N.A.	15.87	0.00
GRAFT	0.00	3.17	HARD	12.70	0.00
DRAFT	6.35	68.25	PART	17.46	0.00
DRAB	63.49	28.57	HARSH	3.17	98.41
GRAB	26.98	0.00	HEART	53.97	0.00
N.A.	3.17	0.00	N.A.	12.70	0.00

RESPONSE	G.D.	B.N.	RESPONSE	G.D.	B.N.
STARDOM	3.17	0.00	EIGHT	93.65	0.00
PARDON	84.13	1.59	ACHE	3.17	1.59
GARDEN	0.00	98.41	HATE	0.00	96.83
AUTUMN	1.59	0.00	BAKE	0.00	0.00
N.A.	11.11	0.00	N.A.	3.17	1.59
CALL	1.59	0.00	REVOLVE	0.00	7.94
BALL	6.35	96.83	INVOLVE	0.00	0.00
HALL	79.37	0.00	RESOLVE	1.59	88.89
SMALL	1.59	0.00	DISSOLVE	95.24	0.00
N.A.	12.70	3.17	N.A.	3.17	3.17
BUBBLE	7.94	0.00	NEEDLE	95.24	3.17
STUBBLE	1.59	93.65	FETAL	0.00	3.17
TROUBLE	4.76	1.59	EAGLE	1.59	0.00
DOUBLE	76.19	3.17	BEETLE	0.00	88.89
N.A.	9.52	1.59	N.A.	3.17	4.76
TOP	88.89	3.17	ABLE	0.00	0.00
HOP	0.00	0.00	STABLE	0.00	0.00
POP	7.94	9.52	FABLE	93.65	1.59
PROP	1.59	87.30	TABLE	1.59	92.06
N.A.	1.59	0.00	N.A.	4.76	4.76
TOOL	1.59	88.89	RECLINE	88.89	9.52
CRUEL	92.06	6.35	REFINE	4.76	6.35
DROOL	1.59	1.59	RECLAIM	3.17	4.76
COOL	1.59	0.00	REPLY	0.00	73.02
N.A.	3.17	3.17	N.A.	3.17	6.35
STORAGE	76.19	6.35	FOLLY	12.70	73.02
PORRIDGE	0.00	87.30	VOLLEY	82.54	19.05
SHORTAGE	17.46	4.76	POLISH	0.00	0.00
STORY	3.17	0.00	TROLLEY	0.00	0.00
N.A.	3.17	1.59	N.A.	4.76	4.76

RESPONSE	G.D.	B.N.	RESPONSE	G.D.	B.N.
GAVE	0.00	0.00	CLAD	3.17	3.17
SHADE	92.06	26.98	CLAN	9.52	6.35
FADE	3.17	0.00	PLAN	79.37	12.70
SHAVE	1.59	68.25	PLANT	1.59	65.08
N.A.	1.59	4.76	N.A.	4.76	12.70
EFFECT	9.52	77.78	LIFT	88.89	31.75
EXPECT	0.00	0.00	RIFT	3.17	14.29
INSPECT	3.17	1.59	DRIFT	3.17	12.70
INFECT	84.13	9.52	LIST	1.59	23.81
N.A.	3.17	11.11	N.A.	3.17	17.46
HARD	1.59	84.13	BEHAVE	1.59	0.00
CARD	92.06	4.76	WITHHOLD	6.35	9.52
CORD	1.59	1.59	REVOLT	0.00	73.02
HARSH	0.00	1.59	BEHOLD	88.89	3.17
N.A.	4.76	7.94	N.A.	3.17	14.29
STRANGE	19.05	0.00	QUARRY	0.00	9.52
BRING	11.11	0.00	GLORY	92.06	33.33
RAIN	3.17	88.89	GORY	3.17	53.97
BRAIN	58.73	1.59	SORRY	0.00	0.00
N.A.	9.52	9.52	N.A.	0.00	4.76
WAD	1.59	77.78	SUCH	1.59	73.02
WASH	1.59	4.76	TOUCH	1.59	7.94
SQUAD	79.37	4.76	NUT	96.83	1.59
SQUASH	9.52	1.59	BUTT	0.00	6.35
N.A.	7.94	11.11	N.A.	0.00	11.11
PLANT	3.17	0.00	FORCE	100.00	7.94
CLAMP	4.76	4.76	FOURTH	0.00	6.35
CRAMP	15.87	85.71	COURSE	0.00	3.17
TRAMP	69.84	0.00	HORSE	0.00	76.19
N.A.	6.35	9.52	N.A.	0.00	6.35

RESPONSE	J.H.	G.D.	RESPONSE	J.H.	G.D.
COCK	12.70	1.59	TOOK	0.00	90.48
CROOK	87.30	0.00	SHOOK	93.65	0.00
BROOK	0.00	98.41	SHOCK	6.35	1.59
BOOK	0.00	0.00	COCK	0.00	0.00
N.A.	0.00	0.00	N.A.	0.00	7.94
FAIR	95.24	1.59	OPEN	0.00	1.59
BARK	3.17	6.35	OBOE	4.76	65.08
CARE	0.00	1.59	OPAL	93.65	20.63
PAIR	0.00	90.48	OVAL	1.59	3.17
N.A.	0.00	0.00	N.A.	0.00	9.52
ANGLE	0.00	0.00	TRIAL	15.87	4.76
AMPLE	11.11	1.59	FILE	0.00	0.00
AMBLE	87.30	1.59	FRAIL	3.17	77.78
APPLE	1.59	96.83	TRAIL	82.54	7.94
N.A.	0.00	0.00	N.A.	0.00	7.94
BRINK	12.70	87.30	BLANE	100.00	1.59
BRIDGE	1.59	0.00	BLAME	0.00	1.59
BRISK	0.00	1.59	CLAIM	0.00	95.24
BRICK	84.13	4.76	PLANE	0.00	0.00
N.A.	1.59	4.76	N.A.	0.00	1.59
SKIN	0.00	88.89	WORM	7.94	3.17
HYMN	0.00	3.17	WORK	0.00	1.59
VEIN	0.00	0.00	WORD	9.52	92.06
DIM	98.41	0.00	WERE	79.37	3.17
N.A.	1.59	9.52	N.A.	3.17	0.00
ACTION	0.00	0.00	RELIEVE	19.05	71.43
MATCHING	95.24	6.35	RECEIVE	0.00	0.00
MAGIC	3.17	3.17	RELIEF	79.37	28.57
SMASHING	0.00	80.95	RELEASE	1.59	0.00
N.A.	1.59	9.52	N.A.	0.00	0.00

RESPONSE	J.H.	G.D.	RESPONSE	J.H.	G.D.
CLOCK	4.76	100.00	WORLD	60.32	6.35
BLOCK	1.59	0.00	WHIRL	39.68	1.59
PLOT	84.13	0.00	WOOL	0.00	6.35
BLOT	4.76	0.00	WOULD	0.00	84.13
N.A.	4.76	0.00	N.A.	0.00	1.59
KIND	80.95	0.00	HAPPY	0.00	0.00
PINE	9.52	0.00	HANDY	100.00	0.00
FINE	1.59	100.00	CANDY	0.00	96.83
TIME	4.76	0.00	ENVY	0.00	1.59
N.A.	3.17	0.00	N.A.	0.00	1.59
LEAPING	0.00	1.59	DODGE	0.00	96.83
SLEEPING	98.41	0.00	DARK	3.17	0.00
CREEPING	0.00	0.00	DOT	90.48	3.17
REAPING	0.00	98.41	DOCK	4.76	0.00
N.A.	1.59	0.00	N.A.	1.59	0.00
EIGHTY	98.41	1.59	CONSCRIPT	0.00	3.17
AC ING	0.00	0.00	CONFLICT	0.00	0.00
DAINTY	0.00	87.30	ASSIST	0.00	95.24
BABY	1.59	3.17	UNFIT	98.41	0.00
N.A.	0.00	7.94	N.A.	1.59	1.59
PROOF	0.00	87.30	REFER	0.00	1.59
HOOP	0.00	4.76	REHEARSE	6.35	3.17
GROUP	0.00	0.00	REVERSE	93.65	22.22
SWOOP	100.00	0.00	REVERT	0.00	71.43
N.A.	0.00	7.94	N.A.	0.00	1.59
WHIP	0.00	0.00	BUDGET	98.41	0.00
QUIT	84.13	0.00	BUCKET	1.59	98.41
QUICK	15.87	1.59	BUNION	0.00	0.00
TWIST	0.00	93.65	BUDGE	0.00	0.00
N.A.	0.00	4.76	N.A.	0.00	1.59

REHEARSE	C.D.	C.D.	REHEARSE	C.D.	C.D.
[illegible]	0.00	0.00	NEGLECT	0.00	0.00
[illegible]	0.00	0.00	DEFLECT	95.24	0.00
[illegible]	88.89	38.10	REFLECT	4.76	98.41
[illegible]	11.11	61.90	REFLEX	1.59	1.59
N.A.	0.00	0.00	N.A.	0.00	0.00
[illegible]	96.83	1.59	LOST	0.00	0.00
[illegible]	0.00	0.00	LONG	1.59	0.00
[illegible]	3.17	0.00	LOG	28.57	57.14
[illegible]	0.00	98.41	LAW	60.32	42.86
N.A.	0.00	0.00	N.A.	9.52	0.00
[illegible]	98.41	12.70	ROBBER	0.00	98.41
[illegible]	0.00	0.00	JOBBER	93.65	1.59
[illegible]	0.00	1.59	HARBOR	3.17	0.00
[illegible]	1.59	85.71	SHOPPER	3.17	0.00
N.A.	0.00	0.00	N.A.	0.00	0.00
[illegible]	0.00	0.00	HELD	0.00	25.24
[illegible]	7.94	3.17	BELL	3.17	1.59
[illegible]	80.95	39.68	FELL	9.52	3.17
[illegible]	11.11	57.14	TELL	85.71	0.00
N.A.	0.00	0.00	N.A.	1.59	0.00
[illegible]	96.83	3.17	INVITE	88.89	3.17
[illegible]	0.00	50.79	INSIGHT	6.35	0.00
[illegible]	3.17	25.40	INSIDE	0.00	6.35
[illegible]	0.00	19.05	ADVICE	1.59	87.30
N.A.	0.00	1.59	N.A.	3.17	3.17
[illegible]	0.00	6.35	BLAST	0.00	68.25
[illegible]	7.94	4.76	FLAT	73.02	6.35
[illegible]	0.00	87.30	FLAK	23.81	6.35
[illegible]	92.06	1.59	BLACK	1.59	15.87
N.A.	0.00	0.00	N.A.	1.59	3.17

RESPONSE	C.D.	C.D.	RESPONSE	C.D.	C.D.
PLAYFUL	0.00	100.00	EGG	3.17	100.00
FAITHFUL	79.37	0.00	EDGE	95.24	0.00
FATEFUL	20.63	0.00	HEDGE	1.59	0.00
BASEBALL	0.00	0.00	HEAD	0.00	0.00
N.A.	0.00	0.00	N.A.	0.00	0.00
SUIT	77.78	0.00	FINDING	0.00	0.00
SHOOT	22.28	0.00	BINDING	100.00	95.24
BOOT	0.00	1.59	BLINDING	0.00	4.76
FRUIT	0.00	98.41	LANDING	0.00	0.00
N.A.	0.00	0.00	N.A.	0.00	0.00
DEPEND	0.00	1.59	TINT	0.00	84.13
DETAIN	15.87	96.83	PRINT	28.57	1.59
BECAME	82.54	0.00	PRINCE	69.84	0.00
RETAIN	1.59	1.59	TENSE	1.59	14.29
N.A.	0.00	0.00	N.A.	0.00	0.00
PLURAL	0.00	0.00	DESK	95.24	3.17
NEUTRAL	0.00	0.00	DECK	0.00	95.24
RURAL	80.95	4.76	DEATH	3.17	0.00
RULER	19.05	95.24	DEBT	0.00	1.59
N.A.	0.00	0.00	N.A.	1.59	0.00
NOUN	4.76	0.00	BOTH	1.59	0.00
NEW	36.51	61.90	BOAT	34.92	100.00
NUDE	15.81	38.10	VOTE	63.49	0.00
NOON	42.86	0.00	QUOTE	0.00	0.00
N.A.	0.00	0.00	N.A.	0.00	0.00
BRAVE	1.59	0.00	YAWN	0.00	0.00
STAVE	6.35	92.06	JUMP	0.00	82.54
BATTLE	1.59	1.59	JUNK	0.00	17.46
SAVE	90.48	6.35	YOUNG	100.00	0.00
N.A.	0.00	0.00	N.A.	0.00	0.00

APPENDIX 1

BASED ON 63 LISTENERS

NUMBER WRONG	PERCENTAGE	NUMBER WRONG	PERCENTAGE
1	1.59	33	52.38
2	3.17	34	53.97
3	4.76	35	55.56
4	6.35	36	57.14
5	7.94	37	58.73
6	9.52	38	60.32
7	11.11	39	61.90
8	12.70	40	63.49
9	14.29	41	65.08
10	15.87	42	66.67
11	17.46	43	68.25
12	19.05	44	69.84
13	20.63	45	71.43
14	22.22	46	73.02
15	23.81	47	74.60
16	25.40	48	76.19
17	26.98	49	77.78
18	28.57	50	79.37
19	30.16	51	80.95
20	31.75	52	82.54
21	33.33	53	84.13
22	34.92	54	85.71
23	36.51	55	87.30
24	38.10	56	88.89
25	39.68	57	90.48
26	41.27	58	92.06
27	42.86	59	93.65
28	44.44	60	95.24
29	46.03	61	96.83
30	47.62	62	98.41
31	49.21	63	100.00
32	50.79		